



Sand Dune and Shingle Network

22nd Newsletter, November 2024

Linking science and management



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Introduction



Paul Rooney
Network Director

The Network has its roots in an informal collective of coastal dune enthusiasts from across Europe established in the late 1980s. With John

Houston, we had a dune network in North West England in the late 1980s and early 1990s and then an informal network of dune enthusiasts was nourished through several EU LIFE projects, including that on the Sefton Coast, North West England 1995-1999.

The present-day Network was officially launched at a national Biodiversity conference in Liverpool, December 2006. Based in Liverpool Hope University, the Network benefited from two rounds of funding from the 'Higher Education Innovation Fund' (HEIF) along with support from statutory agencies. Its need and value as a way to enthuse and support those involved in the conservation of dunes and shingle was well proven.

Dune conservation and networking activities in the UK were taken up by two fantastically successful EU LIFE projects, 'Sands of Life' 2018 - 2024 and 'Dynamic Dunescapes' 2019 - 2024. These projects brought together an impressive range of partners including Natural Resources Wales, Natural England, Plantlife, The National Trust, the Wildlife Trusts and benefited from funding from the National Lottery.

Before these successful projects concluded, conversations were started to keep up the conservation momentum through a refreshed and relaunched Network. During 2024 and 2025 the partners in these projects, along with other key stakeholders, came together to agree a 'Memorandum of Understanding' and a three-year work programme for the Network. This is where we are at present. Funds are secured. A work programme is agreed. There is an exciting future ahead.

This is the first newsletter of the relaunched Network. Read more about what is planned and please get in touch with us if you can offer support or have ideas for activities. Afterall, it's your Network.

Network News



Thomas Smyth
Network Assistant

Welcome to issue 22 of the Sand Dune and Shingle Network Newsletter. I'm delighted to introduce myself as the new assistant for the Network.

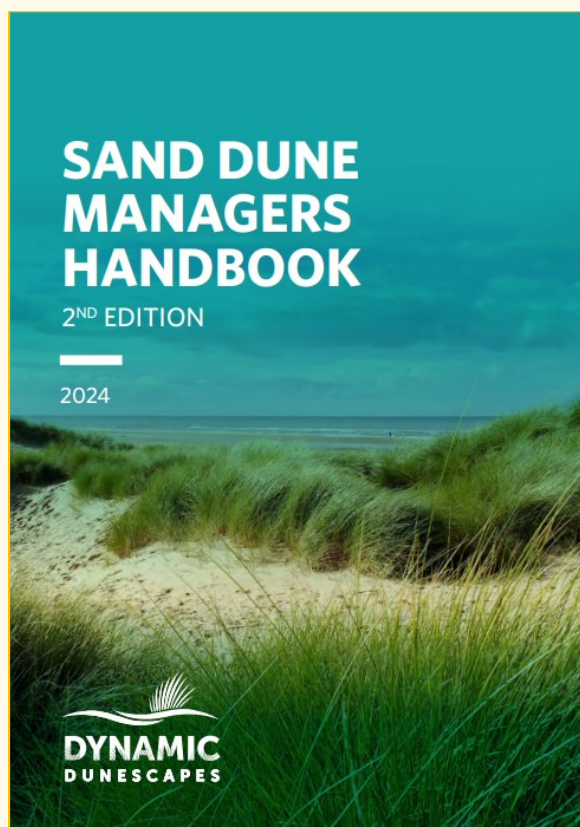
I am a coastal geomorphologist, with particular expertise in understanding how wind flow and sediment transport influence the development and dynamics of dunes and blowouts. I started my role as network assistant in September 2024 and have been a member of the Network since 2015. Since starting in the role, one of the aspects I've enjoyed most is witnessing the passion and dedication of everyone involved in the network. My work at the Network allows me to combine my academic background and research interests with applications that contribute directly to coastal conservation and the protection of these important landscapes.

I am also fortunate to work alongside our student intern, Jordan Masters, who is currently studying at Liverpool Hope University. Jordan has been playing a crucial role behind the scenes, particularly in archiving the network's historical publications, ensuring that all of the valuable past research and insights are preserved and easily accessible for future use. In addition, Jordan has been writing a fascinating article for this newsletter, focusing on the critical issue of invasive alien species in Ukrainian dunes. It's a timely piece that sheds light on how these invasive species are impacting coastal ecosystems, and I encourage you to give it a read.

I'm very excited about the future of the Sand Dune and Shingle Network and look forward to working closely with all of you to continue advancing our shared goals. Have a look at the 'Events' section on page 17 of the newsletter to see how you can get involved. If you have any suggestions or ideas for the following newsletter, please do not hesitate to contact us at dunes@hope.ac.uk.

Second Edition of the Dynamic Dunescapes Sand Dune Managers handbook released

The second edition of the Dynamic Dunescapes Sand Dune Manager's Handbook was released in September 2024. This comprehensive update was designed to help site managers and landowners across the UK improve the condition of sand dunes and safeguard the rare and unique species that thrive in these habitats.



Cover of the Sand Dune Managers Handbook

Drawing on the lessons from the Dynamic Dunescapes project, the handbook features 35 detailed case studies contributed by local site managers and project collaborators. These case studies offer valuable insights into innovative and adaptive dune management techniques, providing best practices to support others involved in dune restoration.

The handbook begins with an overview of dune ecology, geomorphology, and hydrology, explaining the importance of conserving dunes. It also offers practical guidance on initiating dune restoration projects, covering topics such as project planning, funding options, and securing permissions. Presented in a clear and accessible format, similar to the successful Catchment Based Approach (CaBA) publications, the handbook provides a UK-wide perspective. It includes contributions from other major dune projects, such as Sands of LIFE in Wales and Gems in the Dunes as part of

the Back from the Brink initiative. A new section in this second edition of the handbook highlights machair, a rare habitat found on the northwest coasts of Scotland and Ireland, renowned for its rich biodiversity.

The second edition also addresses the impact of wider land uses, such as military training, golf courses, and forestry, on dune systems. It explores the challenges these activities pose to restoration efforts while identifying opportunities for partnerships and collaborative management.



An example of one of the 35 case studies in the handbook

In addition, the handbook emphasises the importance of effective communication around dynamic dunes. It offers guidance on disseminating key messages and showcases successful engagement campaigns, like Paws for Thought and Arty Cows. These initiatives illustrate how connecting arts, dunes, and local communities can foster meaningful conversations about the landscape and its preservation.

You can read and download the handbook from Dynamic Dunescapes website [here](#).

Shared Experiences and Future Plans: Sands of LIFE Conference, May 2024

Summarised by Thomas Smyth, Sand Dune and Shingle Network Assistant

The Sands of LIFE conference took place on 15 to 17 May 2024 with more than 100 delegates from the UK and overseas gathered in person and online to hear from local and international experts about sand dune conservation and management at the Celtic Royal Hotel in Caernarfon.

Nick Thomas (Natural Resources Wales) warmly welcomed participants to the event, and Clare Pillman, CEO of Natural Resources Wales, delivered the opening speech, setting the stage for a thoughtful discussion. The conference explored not only the achievements but also the lessons learned from the Sands of LIFE project. Key issues were raised, including the prospects for restoring dunes that have been converted to forestry, agriculture, or other land uses. Another significant topic was the impact of atmospheric nitrogen on dunes and the strategies needed to mitigate it. Discussions also focused on how to maintain, or even increase, grazing as farmers face rapid changes. With dunes under pressure from climate change and coastal squeeze, the question arose of how we can facilitate their natural "roll back" while addressing the restoration of hydrological and sand dune systems on a broader, landscape scale.

Five Years of Action

In the conference's second session, Kathryn Hewitt, Sands of LIFE Project Manager, reflected on the remarkable progress made over the past five years. She outlined a series of achievements that surpassed the original targets, from innovative techniques like dune notching to successful community outreach. Importantly, she paid tribute to the individuals and teams whose efforts were critical to the project's success. Steven Heathcote, Principal Ecologist from JBA Consulting, presented the results of vegetation surveys across ten Welsh dune systems, comparing data from 2019 with surveys conducted between 1981 and 1991. The findings revealed a worrying decline in the extent of mobile dune habitats, with many areas shifting from semi-fixed dunes to more stabilised, fixed dunes. Steven's presentation only scratched the surface of the available data, and he eagerly invited future collaboration to explore these findings further. Mike Howe, an invertebrate ecologist at Natural Resources Wales, shared his insights on the effects of conservation measures on Welsh dune invertebrates. He revealed that almost 3,000 invertebrate species can be found in some of Wales' larger dunes, and about 20% of these species are almost exclusively dependent on sand dune habitats. Mike

stressed the importance of pioneer habitats, explaining that within just a few weeks of restoration efforts, certain species began recolonizing the rejuvenated landscapes, a positive sign for dune biodiversity.



The conference including site visits to nearby dune sites such as Newborough National Nature Reserve and Forest on Anglesey

Forestry in Dunes

The third session focused on the complexities of managing forestry within sand dunes. Laura Davies and Kathryn Hewitt discussed the challenges they faced in felling trees at Welsh sites like Whiteford Burrow and Morfa Harlech. The difficulties included dealing with unexploded ordnances, navigating licensing costs, and engaging with the public throughout the process. Marc van Til of Waternet added an international perspective, sharing his experience with conifer removal in the Amsterdam dunes. He highlighted the effectiveness of combining tree felling with topsoil removal to restore grey dune characteristics and improve conservation outcomes. Dave Mercer from Natural England closed the session by reflecting on the long history of dune restoration at Ainsdale Sand Dunes National Nature Reserve on the Sefton Coast. He emphasised the essential role of stakeholder engagement in shaping future restoration efforts at the site.

Radical Conservation Approaches

The fourth session showcased a range of innovative and, in some cases, radical approaches to sand dune conservation from across Europe. Esther Rodriguez from PWN in the Netherlands shared a fascinating case study on the introduction of European bison to Dutch dunes.

Unlike cattle or horses, bison have a unique impact on the ecosystem, creating sand patches through their wallowing behaviour. Esther also noted that these large grazers have successfully coexisted with humans and other herbivores on the site, demonstrating their potential in dune conservation.



One of Luc Geelen's unexpected challenges of reintroducing rabbits to dunes in the Netherlands

Siobhan Murphy from Natural England focused on the impact of air pollution, particularly nitrogen deposition, on sand dune ecosystems. It was emphasised that sand dune flora is highly sensitive to nitrogen, and that 65% of SACs in England are affected by air pollution. Drawing from examples at Branton Burrows and the Sefton Coast, Siobhan highlighted the importance of engaging farmers and stakeholders in the management process. Luc Geelen from Waternet shared his unique experience of reintroducing rabbits to the Dutch dunes, where they are listed as a vulnerable species. Luc's engaging talk touched on some unexpected challenges, including the importance of a "soft" release to ensure the success of reintroduction efforts. Jeppe Pilgaard, biologist and project manager at Thy National Park in Denmark, rounded off the session with a presentation on restoring agricultural land to dunes. Jeppe underscored the importance of working with willing partners, establishing habitat connectivity, and removing excess nutrients to facilitate successful restoration.

Tackling Current Challenges

In the penultimate session, Reinhardt Strubbe from LIFE Dunias in Belgium addressed the issue of invasive species in sand dunes. The presentation demonstrated how management interventions varied by species, with follow-up actions being critical to long-term success. Reinhardt also showcased an early warning system for invasive alien species, allowing for swift management responses to emerging threats. Lucy Smith from Sands of LIFE discussed the unforeseen challenges posed by unexploded ordnances on Welsh dune sites. Although the mitigation process was more extensive and costly than anticipated, it was ultimately successful, with all unexploded ordnances being safely

dealt with during planned searches. Kate Linck then presented the socio-economic benefits of sand dunes, drawing on survey data that shed light on why people visit dunes and how these landscapes contribute to public health and well-being in Wales.

Final Session: Future of Sand Dune Conservation

The conference concluded with a forward-looking session on the future of sand dune conservation across Scotland, England, and Wales. Angus Stewart from NatureScot discussed the pressing threat of habitat fragmentation in Scotland's dune ecosystems. Angus highlighted the need for increasing dune mobility to build resilience in the face of climate change and stressed the importance of stakeholder collaboration to ensure the long-term health of coastal systems. Marina Pugh of Natural England shared details of Natural England's future strategy, which centres on resilience and adaptation to climate change. Marina explained how an adaptive delivery plan will help identify site-specific vulnerabilities and guide appropriate interventions. The role of marine and coastal habitat restoration principles in shaping future projects was also emphasised in the presentation. Julie Creer from Sands of LIFE introduced Wales' sand dune conservation strategy, which focuses on increasing coastal resilience, building relationships with local communities, and continuing to support underserved coastal areas. Julie outlined the programme for future dune works as part of the AfterLIFE plan, which will build on the progress made over the past five years. The presentation concluded by summarising the potential role of the Sustainable Farming Scheme in managing SSSI sites.



Some of the audience 'looking for gold' as part of Paul Rooney and Ben McCarthy's presentation

The conference wrapped up with remarks from Paul Rooney (Liverpool Hope University) and Ben McCarthy (National Trust), who reminded attendees of the scarcity and irreplaceable value of coastal dunes. Paul and Ben announced the exciting relaunch of the Sand Dune and Shingle Network, which will continue to champion evidence-based conservation practices and foster knowledge exchange and collaboration across sectors.

All conference talks were recorded and are available to watch on the [Natural Resources Wales website](#).

Celebrating Fifty Years of Continuous Research at the Ainsdale Dune Slacks Experiment

Ben Sykes, Executive Director, Ecological Continuity Trust

Cast your minds back to 1974 for a moment. Perhaps you are thinking of the three-day week and power-cuts, or even flared trousers and the immediate legacy of the Apollo moon missions. Whilst all that was going on, ecologist Sally Edmondson was busy setting up the first grazing exclosures in an increasingly important long-term grazing experiment (LTE) in the dune slacks at Ainsdale Dunes National Nature Reserve (NNR) on the West Lancashire coast. Now known as the Sally Edmondson plots, the exclosures have since been expanded by new researchers following on from Sally's lead, such that the experiment has survived intact to see its 50th consecutive research year in 2024. Few LTEs make it to their half-century in the face of assorted challenges, not least of which is the lack of long-term funding from the UK's leading funding agencies. And so this milestone is a cause for local and national celebration, recognising that LTEs become more and more valuable to both science and society the longer they run. They become part of the UK's scientific heritage, establishing priceless long-term datasets that enable us both to look back to see where we have come from, and to look forwards to see what land use change and climate change may mean for future biodiversity and ecosystem services. They are *time machines* so to speak.



Attendees at the event

On 3 October, this important occasion was suitably marked at Ainsdale after the Ecological Continuity Trust (ECT) collaborated with Natural England, Loughborough University and Lund University to organise and host a one-day event at the dunes comprising talks from researchers past and present and concluding with guided tours of the plots themselves. Around 40 invited guests attended. Following a welcome from the ECT and co-organising partners, Carly Stevens of Lancaster University (and an ECT trustee) delivered a superb keynote presentation on the importance of LTEs in general, before Ben Le Bas of Natural England spoke about how its NNRs are being used for research in an increasingly

strategic manner. After a buffet lunch out in the autumn sunshine, special guest Sally Edmondson spoke about the origins and early years of the Ainsdale grazing experiment. Current Principal Investigators Jon Millett (Loughborough) and Ciara Dwyer (Lund) then took up the baton to bring the audience fully-up-to date with the latest data from the experiment, before giving way to a series of short talks from undergraduate and post-graduate students from a range of institutions who have been using the experiment as a *re-search platform* for their own studies. Dave Mercer from Natural England then rounded off proceedings with a tribute to NE's volunteer team who do a great deal to help keep studies like the grazing LTE going from year to year. Ainsdale Dunes is a very special place, and delegates were then given the opportunity to see the plots for themselves with guided tours from Jon, Ciara, Sally and Natural England staff. But not before the ceremonial cutting of a celebratory cake (pictured) by Sally Edmondson.



Sally's celebratory cake

The gods smiled upon us with some fine weather for the time of year, enabling this outdoor (tent-based) event to proceed smoothly and leave a memorable lasting impression. Here's to the next 50 years of the Ainsdale Dune slacks LTE, about which you can read more here: <https://www.ecologicalcontinuitytrust.org/ainsdale-dune-slacks>.

A new film from Ecological Continuity Trust explores the critical role of long-term ecological experiments in tackling climate and biodiversity crisis is available on the Trust's [YouTube page](#).

Dune hydrology – the Ainsdale long term groundwater monitoring programme

Dr Derek Clarke, University of Southampton (retired)



This article describes a 50+ year groundwater monitoring project at Ainsdale Sand Dunes National Nature Reserve in the UK. Groundwater is a key driver of biodiversity. The water table in the dune system typically rises and falls by about 1.0 m between winter and summer. However, there have been several periods where water table levels were considerably lower than average, which caused the dune floors to dry up, with undesirable environmental effects. These dry periods have been interspersed by occasional wet years where the water table has risen to above average levels. The long term groundwater monitoring project is the longest of its kind in the UK and provides us with insights into groundwater recharge and the environmental factors that drive the short and long term changes in ground water levels.

1. Background

Ainsdale Sand Dunes National Nature Reserve is located in North West England. It forms the central section of a 21 km long belt of coastal sand dunes that run from Crosby to Southport. The Nature Reserve has an area of 5 km² and was established in 1965. The Reserve comprises of a mixture of open dunes, flooded slack floors and wooded dune ridges that support over 450 plant species and fauna such

as sand lizards, tiger beetles and Natterjack toads <https://publications.naturalengland.org.uk/publication/35018>.

When the Reserve was established, the water table in the dunes was relatively high. Many of the dune slacks were flooded up to 50 cm deep during winter and springtime, providing a good breeding resource for the Natterjack toad. In the early 1970's, the water table fell by 50-100 cm and many dune slacks dried up. Although these changes roughly correlated with periods of relatively high and low rainfall, little was known of the impact of other factors which might affect groundwater recharge. In the 1970's a pumped drainage system was commissioned to improve agricultural drainage inland of the Reserve and this period also saw the expansion of urban areas of Southport, Ainsdale and Formby with their associated road drainage systems, which intercept water which would naturally drain to the water table.

A network of 13 observation well tubes were installed across the Reserve in 1972 to monitor these changes in groundwater levels. The wells were spaced in a rectangular grid roughly 500 m x 500 m. Each well tube comprised a 75 mm diameter perforated plastic tube of length between 2-3 m, depending on the depth to water table. Regular water



Figure 1 : Location map and aerial view of the coastal dune system at Ainsdale (image : Google Earth)

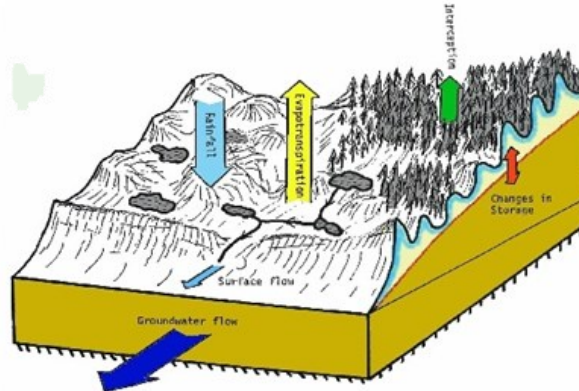
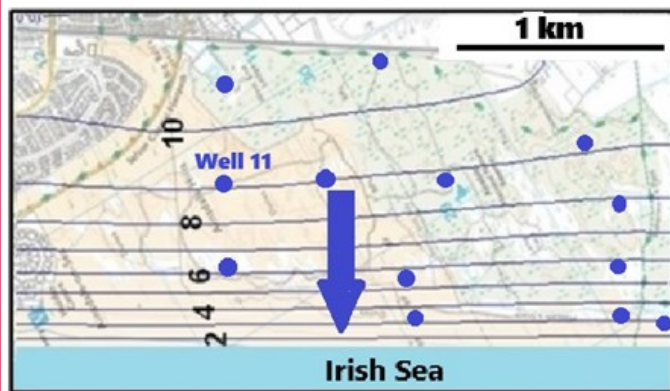


Figure 2a – Well tube network in 1972 and groundwater contours (mAOD) Figure 2b – conceptual water balance model

table level measurements were made by Reserve staff and volunteers on the first of each month, commencing in 1972.

Average water table contours have been interpolated from the well measurements – Fig 2a. The water table slopes towards the sea, falling from 10-11 m AOD to the mean high water mark at +4 m AOD. This indicates that groundwater flow moves in a westerly direction through the Reserve (blue arrow) and in an easterly direction inland of the edge of the tree belt.

2. Trends in groundwater levels

The monthly groundwater measurements are currently ongoing (2024), and we now have an uninterrupted sequence of over 50 years of observations, which is the longest such data set in the UK. Figure 3 is a plot of the monthly data from a representative well in the open dunes.

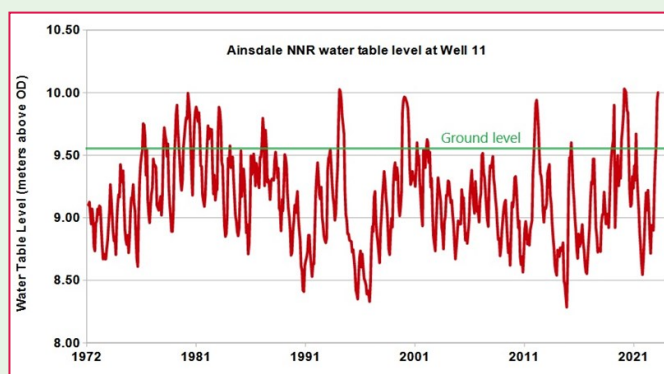


Figure 3 : Monthly observations of water table levels in Well 11 in the sand dune aquifer at Ainsdale, 1972-2024.

From this plot we can see a typical summer-winter rise and fall in water levels. However, on top of these changes there appear to be cyclical trends. Remembering that the Nature Reserve was set up in 1965 when water levels were high, the first few years in the 1970's reflect the low water table conditions that prompted the installation of the wells and the monitoring programme.

Interestingly if we think of 10 years as a "long term" study, then the period 1972-1981 suggests a continuous rise in

water levels. However, if the "long term" study had started in 1981, the next 10 years indicate a near continuous fall! This illustrates that fact that most climate change studies have to be based on longer intervals – the Met Office uses 30-year time intervals.

The frequency of wet winters can be seen by counting the number of years the winter water levels are above ground level, and although the last few years (2019-2024) have shown exceptional highs, there have also been some very dry years (e.g. 2015). Perhaps we can draw a conclusion from these data – prior to 1991, there were gentle cyclical changes in groundwater recharge, but as we entered the 21st century with its higher temperatures and the onset of climate change, there is more chaos in the system and year to year variability becomes greater.

3. Groundwater recharge modelling

Derek Clarke carried out his PhD research on the groundwater recharge and water balance modelling between 1975 and 1980 (<https://livrepository.liverpool.ac.uk/3167251/>) and Sarinya Sanitwong continued this modelling work at the University of Southampton (<https://eprints.soton.ac.uk/466670/1/1285486.pdf>). They developed a comprehensive groundwater recharge model to simulate the groundwater conditions. This is described in Clarke and Sanitwong (2009) DOI: [10.1007/s11852-009-0066-7](https://doi.org/10.1007/s11852-009-0066-7).

The main components of the model are shown in Fig 2b. The water balance model was able to simulate the effects of differing groundwater recharge rates depending on land use cover and changes in rainfall and evapotranspiration, anticipated sea level rise and projected coastal erosion. Key findings were that areas covered in pine trees received about 10 -15% less groundwater recharge, resulting in the groundwater levels under the pine trees being 50-80 cm lower than in the unforested parts of the Reserve, which is apparent in the right part of Fig 2a. The cause of the lower recharge is due to the interception of light rainfall events by the tree canopy.

This relationship was confirmed in the 1990's when selective tree removal took place in the central part of the reserve and water table levels rose by approximately 40 cm in the following 2 years.

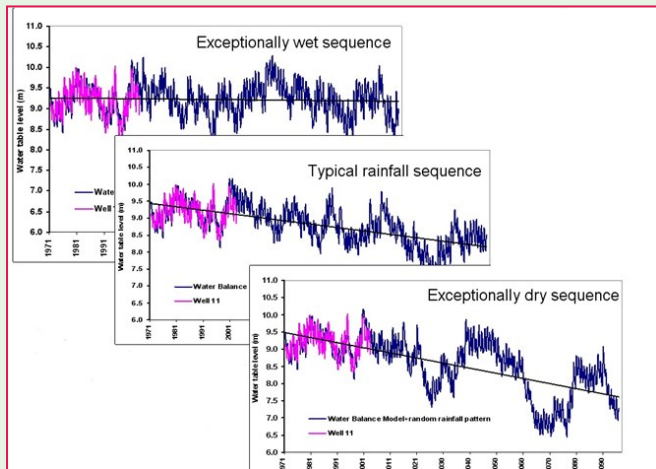


Figure 4 : sample simulations of future groundwater levels at Ainsdale up to 2100

4. Climate Change

One of the great values of long term data sets is that we can begin addressing key questions such as the impacts of climate change, land management and other environmental factors such as sea level rise on the groundwater system and the consequent impacts on the flora and fauna. Some of these changes are relatively slow (e.g. temperature change), but others have a more immediate impact. For example the mean sea level at Liverpool has risen by about 150 mm since the groundwater monitoring started in 1972 <https://ntslf.org/sites/ntslf/files/pdf/images/brecks.pdf>. Although

seemingly small, this rise has contributed to accelerated coastal erosion of the foredunes. At Formby point, 4 km south of the Reserve, the coastline has receded by 500 m and at the southern end of the Reserve, three of the original 13 well tubes have been lost due to 100 m of coastal erosion.

Sarina Santwong's PhD thesis developed a stochastic simulation model to evaluate how projections of future climate change might affect groundwater levels over the 21st century. Expectations are that lower summer rainfall and higher temperatures will increase evaporation in summer, which may lower groundwater levels. However, this is partly counterbalanced by the probability of more intense winter rainfall, which will increase groundwater recharge. Figure 4 shows three representations of possible groundwater levels up to the year 2100. In each case there is the same amount of rainfall but the timing and intensity of the rain storms are different. Overall, the most likely outcome will be a gradual lowering of groundwater levels by 0.5-1.0 m.

5. Hydrological process – detailed monitoring

In 2010, the University of Southampton and CeH Wallingford installed a series of data loggers to augment the monthly measurements. The data loggers have been used to record groundwater levels, air pressure and groundwater temperature at 30 minute intervals. The data provides a rich insight into the dynamics of groundwater recharge over the last 15 years. The University of Loughborough has recently taken over the management of the data loggers and there are plans to make these data sets publicly available.

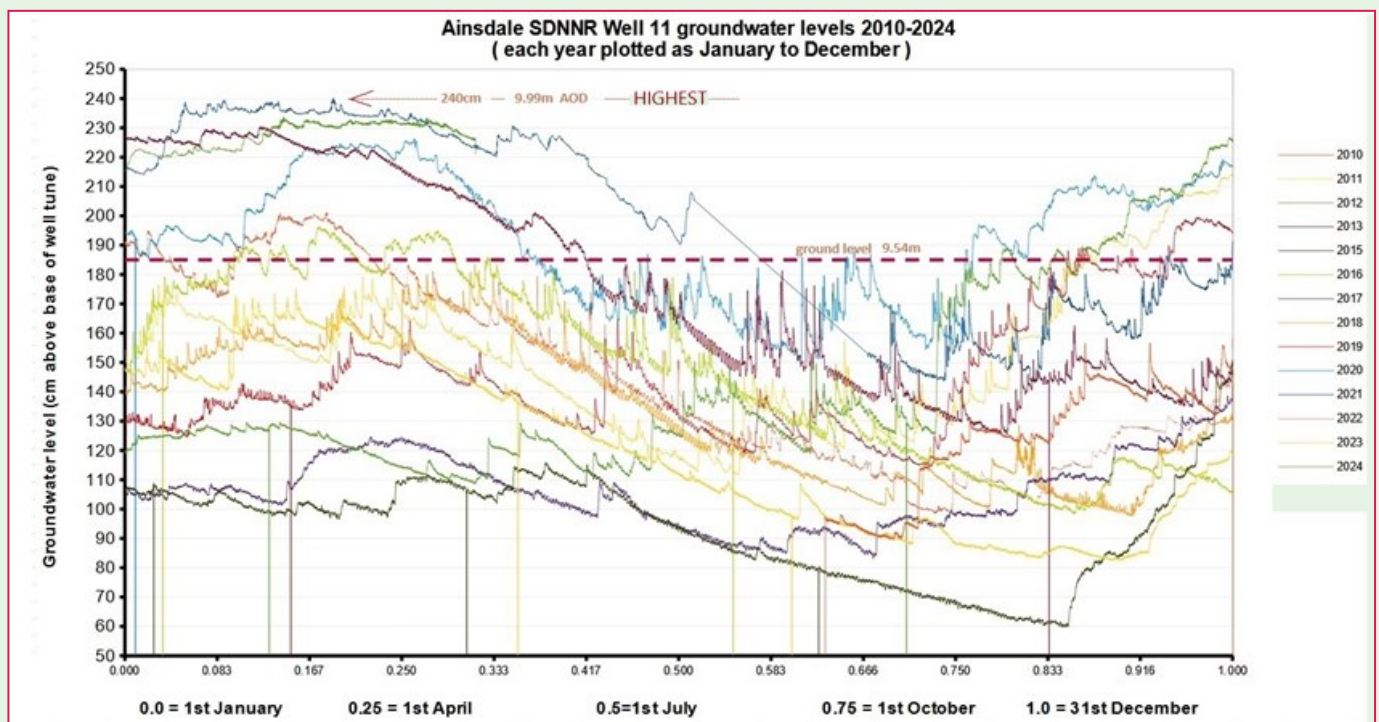


Figure 5 : 30 minute measurements of water levels in Well 11 2010-2024

Invasive Species Sefton Coast Sand Dunes

Philip Smith, Formby Merseyside, UK. Email: philsmith1941@tiscali.co.uk

Invasive species are globally recognised as a major cause of biodiversity decline. England's largest coastal dune system in Sefton, north Merseyside, has long been a microcosm of invasive plant problems, some becoming evident only in the last few years. By 2019, 467 non-native higher plants had been recorded in the Sefton dunes, 38% of the total flora. Fortunately, only 24 (5%) of these show invasive characteristics but several are extremely damaging to duneland ecology.



Sea Buckthorn, *Hippophae rhamnoides*

By far the worst is Sea Buckthorn *Hippophae rhamnoides*, which was introduced by the manorial estates in the 1890s. Following the decline of Rabbits *Oryctolagus cuniculus* in the 1960s, this spiny shrub spread “explosively” in the dunes. As well as replacing native plantlife, *H. rhamnoides* fixes atmospheric nitrogen, making the soil less suitable for specialist dune plants. Control attempts began in the 1960s but slowed during the austerity years from 2010. More recently, the National Trust and Sefton Council sourced funding to remove several large stands, while volunteer groups, such as the ‘Buckthorn Bashers’ tackled smaller clumps and regrowth.

Second on the damage scale is Japanese Rose *Rosa rugosa*. A coastwide volunteer survey in 2014 mapped 600 patches of this garden-escape, covering nearly 6 ha. A separate study showed that larger clumps were growing by over 20% per annum, doubling in size every four to five years. Starting in 2016, it was decided to try and remove all the *R. rugosa* on the Sefton Coast. Several organisations were involved, the largest contribution being from *Dynamic Dunescapes*, which funded digging up and burying most of the clumps mapped in 2014. Patches inaccessible to heavy machinery were sprayed with an appropriate herbicide; spot treatment in subsequent years dealt with any regrowth. So far, the results are impressive but the bill runs into tens of thousands of pounds.



Broad-leaved Everlasting-pea *Lathyrus latifolius*

Another invasive currently causing concern is Broad-leaved Everlasting-pea *Lathyrus latifolius*. This perennial garden-escape began to increase in the dunes early this century. Now, large areas of fixed-dune are infested, especially at Ainsdale and Birkdale Sandhills LNRs. There is limited literature on *L. latifolius* but it is known to grow well in poor soils, is tolerant of frost and drought and achieves dense ground cover. It has similar characteristics to Flat Pea *L. sylvestris*, which is a potentially serious weed in the USA. Complete control of *L. sylvestris* has been achieved using systemic herbicides. Research is needed into appropriate control measures for *L. latifolius*.

Other invasives in the Sefton duneland include Traveller's-joy *Clematis vitalba*, which was the subject of a volunteer survey in 2023. This mapped 117 patches covering 0.64 ha of fixed-dunes, mainly in Ainsdale and Birkdale LNRs. As *C. vitalba* is known to be invasive on sand-dunes elsewhere in Britain, there is a strong case for management action. Chemical control methods have been described in eastern England and New Zealand.

As temperatures rise, many other potential invasives are waiting in the wings. Vigilance and the ability to respond quickly are essential.

Further reading:

Houston, J.A. 2023. *Dune management and invasive species in the UK and Ireland: current position and future challenges*. Dynamic Dunescapes.

Smith, P.H. 2020. Increasing status of non-native vascular plants in the Sefton Coast sand-dune system, north Merseyside, UK. *British & Irish Botany* 2: 102-126.

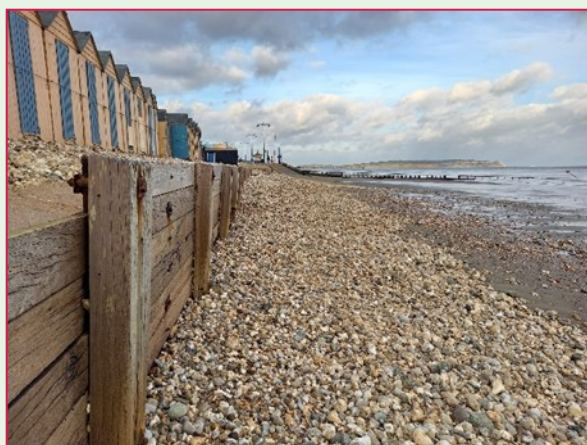
Exciting New Research on Gravel Barriers

Contributions from Prof. Jenny Brown and Prof. Ken Pye.

In 2024, two major research projects funded by the Natural Environment Research Council (NERC) have launched, focusing on the critical role of gravel barriers in coastal defence and ecosystem sustainability. These initiatives, titled *#gravelbeach* and *UKGravelBarriers*, aim to advance our understanding of gravel barrier dynamics, resilience, and adaptation to climate change impacts. Both projects bring together leading experts to inform future coastal management strategies, ensuring that these natural defences continue to protect and support our coastal communities and environments.

#gravelbeach

Led by Dr. Jenny Brown, National Oceanography Centre and Prof Gerd Masselink, University of Plymouth, in collaboration with a wide range of partners from both industry and academia, the £3 million project '*#gravelbeach*' has been funded by the Natural Environment Research Council (NERC). Gravel barriers provide natural flood defences and are increasingly recognized as sustainable, nature-based solutions for enhancing coastal resilience. However, current understanding and modelling of gravel beach dynamics lags behind that of sandy shores. The *#gravelbeach* project aims to address this gap by improving knowledge on how gravel barriers respond to rising sea levels, increased storm activity, and sediment supply changes.



Shanklin Chine, Isle of Wight

Starting in January 2024 and running until September 2027, key outcomes of the project include advancing models that predict gravel barrier behaviour under climate change scenarios and evaluating how natural protection might be compromised. The project also delves into the unique aspects of sediment transport in gravel-sand mixtures and explores the influence of hydraulic conductivity on barrier stability. By differentiating between constructive overtopping and

destructive overwash, researchers hope to better understand the impacts on the areas behind these barriers. More information can be found on the [University of Plymouth #gravelbeach](#) website and a new [gravel resources](#) site hosted with the National Network of Regional Coastal Monitoring Programmes of England.

UKGravelBarriers

A major four-year research project, *UKGravelBarriers*, which is supported by UK Research and Innovation (UKRI), began in April this year in response to a NERC funding opportunity called "Addressing environmental challenges; NERC highlight topics 2023". The project involves collaboration between researchers and practitioners from the British Geological Survey (BGS), UK Centre for Ecology and Hydrology (UKCEH), the University of Nottingham (UoN), Kenneth Pye Associates Ltd (KPAL), Moffat and Nichol (M&N), and ARGANS Ltd.

The overall aim of the project, which is being coordinated and managed by BGS, is to obtain a better understanding of the medium to longer-term dynamics of gravel barrier systems, associated back-barrier environments, and their relationship to coastal structures and other management interventions. The results of the project will be used to inform flood and coastal erosion risk management (FCERM) and habitat conservation across the United Kingdom (UK).

The project will cover all significant gravel barriers in the UK but field studies will focus on a number of contrasting examples including the Salthouse – Cley – Bakeney barrier and back-barrier system in North Norfolk. The investigation methods to be used will include airborne remote sensing, ground geophysics, field surveys of topography, sediment types, hydrology and biota, conceptual and numerical modelling. Four work packages (WP) have been defined in order to deliver the project objectives:

- 1: Evidence assessment: spatial distribution and temporal evolution of UK gravel barriers and back-barrier ecosystems
- 2: Field data collection at selected case study sites
- 3: Development of a broad-scale gravel barrier simulator
- 4: Synthesis: quantification of interactions and management intervention thresholds

Additional information on the project can be viewed at the British Geological Survey [Earthwise website](#),

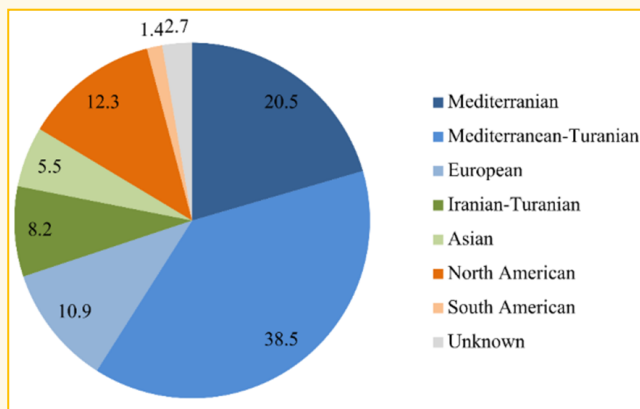
Invasive flora on Ukraine's Dunes:

A summary of Dubyna et al. (2023)

Jordan Masters, Sand Dune and Shingle Network Intern

Alien species can pose a serious threat to native species, ecosystem integrity, and the broader ecological balance. The coastal dune ecosystems of the Black Sea in southern Ukraine are no exception. A recent study investigating these ecosystems (Dubyna et al., 2023) found that 16.3% of flora on Ukrainian coastal dunes consisted of alien species. The spread of these species into Ukraine was primarily driven by abiotic factors, with most alien plants originating from the Mediterranean, Turanian, and North American regions. Of these, 9.4% were classified as neophytes, meaning they had only recently established themselves in the region, putting further pressure on vegetation at this stage of ecological succession.

Additionally, 61.6% of these alien species were therophytes, plants that overwinter as seeds. This life cycle presents challenges for conservation, as the ability of therophytes to disperse seeds complicates management techniques such as uprooting. Even spermatophytes (seed-producing plants) can remain dormant for extended periods, which may require prolonged, resource-intensive control efforts (Dubyna et al., 2023).



Pie chart showing the percentage of invasive plant species found in Ukraine's coastal dunes that originate from different regions/ranges (Dubyna et al., 2023).

The most frequent alien species observed on Ukrainian coastal dunes include cheatgrass (*Anisantha tectorum*, Linnaeus 1758), an annual grass that often inhabits sandy soils; diffuse knapweed (*Centaurea diffusa*, Linnaeus 1758), a biennial plant that forms a rosette in its first year and flowers, seeds, and dies in its second year; and rough brome (*Bromus squarrosus*, Linnaeus 1758), a 20-60 cm tall annual grass native to Russia and Europe (Dubyna et al., 2023).



White dunes with *Leymus racemosus* subsp. *sabulosus*, *Odontarrhena borzaeana* and *Carex colchica* in south Ukraine (Image from: Moysiyenko et al., 2022)

Dubyna et al., 2023 also identified notable differences in invasion levels between shifting and stable dunes, with shifting dunes exhibiting a 19.3% invasion rate compared to 14.6% on stable dunes. Alien plants were more concentrated in habitats along the sandy shores of the Black Sea, highlighting the importance of targeted conservation efforts to curb biodiversity loss.

This study underscores the critical importance of conserving coastal dune ecosystems and the urgency needed to preserve their ecological integrity and biodiversity, particularly in Ukraine's Black Sea and Azov Sea coastal regions (Dubyna et al., 2023).

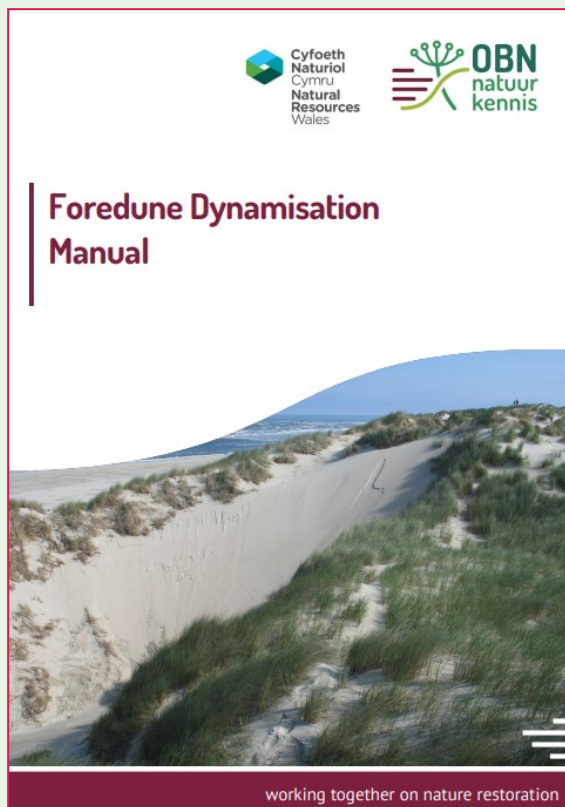
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- Moysiyenko, I., Vynokurov, D., Shyriaieva, D., Skobel, N., Babitskyi, A., Bednarska, I., ... & Dengler, J. (2022). Grasslands and coastal habitats of Southern Ukraine: First results from the 15th EDGG Field Workshop. *Palaearctic Grasslands*, (52), 44-83.

News from around the network

English Translation of Foredune Dynamisation Manual Now Available

An English translation of the *Foredune Dynamisation Manual* (original Dutch title: *Handleiding dynamiseren zeereep*) has been produced to share the Dutch experience of remobilisation interventions with wider English-speaking audiences. This manual, which emerged from the Program for a Rich Wadden Sea, offers insights into creating more dynamic sand dune landscapes.



Cover of the Foredune Dynamisation Manual

The translation, which was financially supported by the Sands of LIFE project and undertaken by Bas Arens, John Houston and Ken Pye, ensures that this valuable knowledge can reach a wider audience. Originally initiated by Albert Oost of the Dutch Forestry Department, the manual reflects contributions from a broad range of public and private organisations in the Netherlands involved in the management and conservation of coastal dunes and serves as an important resource for coastal managers, offering practical guidelines and strategies to promote dune resilience and biodiversity.

[The Foredune Dynamisation](#) manual joins the previously published English translation of the [Small scale wind erosion for the benefit of coastal dune grasslands](#) by OBN.

Potential impacts of pet flea treatments on aquatic invertebrates

The study commissioned as part of the Dynamic Dunescapes (DuneLIFE) project looked at the potential impacts of the pet flea treatments Fipronil and Imidacloprid on the aquatic invertebrates of 12 dune slack ponds from three sand dune Special Areas of Conservation around the English coast.



Dune slack at Braunton Burrows

The study recorded 1,717 specimens across 198 different taxa, with 19 species having formal conservation status providing a strong baseline for understanding the biodiversity of dune ponds in three distinct systems. Pesticide concentrations, including Fipronil and Imidacloprid, were measured in November 2023, January 2024, and June 2024, revealing a range of concentrations in these habitats. Early findings suggest that flea treatments, particularly Imidacloprid, may be affecting aquatic invertebrate communities, with sites showing higher concentrations of treatments tending to have lower species richness and conservation importance, although this correlation was weak. Seasonal variations in pesticide impacts were observed, with clearer negative correlations between pesticide concentrations and species richness in the autumn. In contrast, no significant patterns were found in the spring, likely due to higher water volumes and reduced pesticide use during winter. While no severe negative effects on invertebrate populations were identified, any impacts appear to be subtle, possibly resulting in chronic declines in abundance or diversity. Variability in pond characteristics, such as age, depth, and vegetation, complicated the analysis, making it difficult to isolate the effects of individual factors.

The full report can be downloaded from the [Dynamic Dunescapes website](#).

A new LIFE-funded project: Southern Baltic coastal biodiversity - Dune habitat restoration and development of good management practices (LIFE for Dunes PL)

The project partners are pleased to announce that the LIFE for Dunes PL project, funded by the LIFE programme, will soon be launched. The project's main objective is to prevent the loss of biodiversity typical of coastal areas in Poland, Germany and Lithuania. Coastal dune habitats, which are the dominant ecosystem type of the southern Baltic coast, are currently in danger of disappearing and their conservation status is poor (U2). Due to increasing anthropopressure, climate change and the focus of coastal zone management efforts on artificial shoreline reinforcement, this condition is expected to worsen, and coastal dune habitat resources are expected to be severely reduced in the future.

Project activities will cover parts of the coastline protected under the following Natura 2000 special areas of conservation: PLH220023 Ostoja Słowińska, PLH220018 Mierzeja Sarbska, PLH220003 Białogóra, PLH220021 Piaśnickie Łąki, PLH220032 Zatoka Pucka i Półwysep Helski, PLH280007 Zalew Wiślany i Mierzeja Wiślana, LTKNER0005 Kuršių nerija, LTKLA0009 Pajūrio kopos and DE1544302 Westrügensche Boddenlandschaft Mit Hiddensee.



The Hel Peninsula in Poland. A 36 km sandy spit in the southern Baltic. Photo by Witold Maćków

The project's objective will be achieved through protection and application of restoration measures within the coastal dune habitats and through the scientific research that will provide a foundation for effective management of the Baltic coastal zone. In addition, there is a plan to raise public awareness of the specific threats and methods of protection of coastal dune habitats through information and educational activities.

The project primarily considers two types of priority habitats: 2130* - fixed coastal dunes with herbaceous vegetation (grey dunes) and 2140* - decalcified fixed dunes with *Empetrum nigrum*. However, as the measures within these habitats, without considering the removal of threats to adjacent and spatially dependent habitats, would not have long-term effects, the project also includes restoration measures in the following non-priority habitats: 2110 - embryonic shifting dunes, 2120 - shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), 2190 - humid dune slacks.

A number of activities are planned as part of the project, including: removal of invasive species, creation of ecotone zones through selective tree removal, analysis of local geomorphological processes and their impact on dunes in order to plan and implement more effective methods of dune habitat protection, dissemination of good practices for coastal zone management, educational activities for different social groups, including organisation of workshops, lectures, outdoor events and the production of educational materials.

Project partners (co-beneficiaries) include the 1) University of Gdańsk, Poland - Leader, 2) University of Szczecin, Poland, 3) Institute of Hydroelectric Engineering PAN, Poland, 4) West Pomeranian University of Technology, Poland, 5) EUCC - Die Kusten Union Deutschland EV, Germany, 6) Klaipėdos Universitetas, Lithuania, 7) Pomeranian Voivodship, Poland, 8) Słowiński National Park, Poland.

'LIFE on Machair' project launched in the Republic of Ireland

The LIFE on Machair project, funded from 2022 to 2028, focuses on conserving Ireland's unique Machair habitats, home to important wader and pollinator communities. Targeted across nine areas, including Connemara, South Mayo, and Donegal, this initiative collaborates with farmers, landowners, and local communities to restore these biodiverse landscapes. Managed by Ireland's Department of Housing, Local Government and Heritage, alongside partners like the Department of Agriculture and Fáilte Ireland, the project builds on existing conservation efforts. It aims to promote sustainable practices that support farming, tourism, and rural livelihoods in harmony with nature. More information can be viewed on the projects website www.lifeonmachair.ie

New research projects on factors affecting the mobility of dunes and methods to assess their resilience as a coastal defence

Kenneth Pye Associates Ltd (KPAL) has recently begun work on two related research projects sponsored by Sefton Council's Coastal Defence Team with funding from the Environment Agency's Our Future Coast Innovation Project. The first project will aim to provide a better understanding of the factors which influence the development of mobile sand sheets and transgressive dunes, while the second project aims to develop a new methodology for assessing the resilience of dune systems as a coastal defence.



A large transgressive dune advancing on a caravan park at Freshfield on the Sefton coast (photograph by K. Pye)

The work includes detailed studies in two contrasting areas, an area of eroding coast at Formby Point on the Sefton Coast where some of the most mobile sand sheets and dunes in the UK are currently found, and secondly the shore between Blackpool and Lytham on the Fylde coast where extensive frontal dune progradation has occurred in recent years, encouraged by management interventions. Methods being used in the study include analysis of satellite imagery, airborne LiDAR data, aerial photography, field survey data obtained as part of the Northwest Coastal Monitoring Programme, analysis of meteorological data, climatic data, and data relating to visitor numbers and movements.

Further information can be obtained from KPAL at info@kpal.co.uk.

Advancing Wildlife Monitoring with Automated Technology in the Amsterdam Dunes

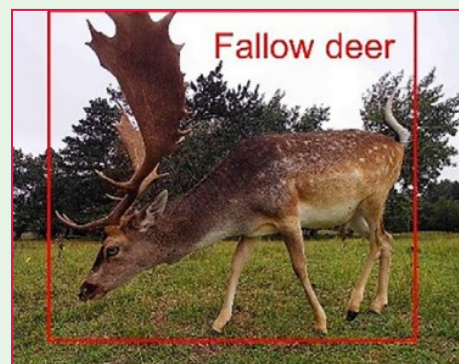
Effective and affordable monitoring techniques are essential for managing and protecting nature. To meet this challenge, researchers in the Netherlands are exploring

advanced technologies like low-power digital sensors, wireless communication systems, and automation. In the Netherlands.

A team from the University of Amsterdam's Institute for Biodiversity and Ecosystem Dynamics has partnered with Waternet, the site manager of the Amsterdam Dunes nature reserve. Together, they aim to develop and implement an automated system for observing wildlife, using a network of camera traps. These camera traps will not only reduce human involvement but also increase the accuracy and efficiency of data collection.

One of the key objectives of this collaboration is to compare the cost-effectiveness of automated camera trapping against traditional, manual methods. This analysis will provide valuable insights into whether automation can offer a more sustainable, scalable solution for long-term wildlife monitoring.

Additionally, the team plans to use this system to gather critical information about ground-dwelling mammals and birds. By studying their distribution, habitat use, activity patterns, population structures, and community dynamics, the researchers hope to gain a deeper understanding of these species' roles within the ecosystem.



Examples of the automated species identification used in the project ([images from Evans et al., 2024](#))

The first results of the project have been recently published in [Basic and Applied Ecology](#) and [Data in Brief](#). An online interactive summary of the project is also available [here](#). More information is available from Luc Geelen (luc.geelen@waternet.nl).

DuneFront Project launched across Europe

The [DuneFront](#) project is an ambitious initiative designed to enhance coastal resilience across Europe by merging natural and engineered elements for coastal protection. The project focuses on developing “Dune-by-Dike” hybrid Nature-based Solutions (DD-hybrid NbS), combining dunes with seawalls to create a sustainable, adaptable, and visually appealing approach to flood defence. By blending these natural and hard structures, DuneFront aims to offer a new generation of inclusive coastal defences that not only protect but also support coastal ecosystems.



Location of the 12 demonstrator sites (image: dunefront.eu/project-information)

A key part of DuneFront’s strategy involves twelve demonstration sites across Europe, where data and practical insights will guide future designs and installations. This groundwork will enable the creation of digital twins, simulating coastal responses to enhance decision-making processes. DuneFront will develop a Decision-Support-System and coastal blueprints for infrastructure, leading to prototype installations along the Belgian coast.

Running from 2024 to 2027, DuneFront is backed by 17 partners from across Europe and the U.S. and is funded through the EU’s Horizon Europe Mission Ocean Programme. Coordinated by Ghent University, DuneFront aligns with the EU Mission’s goal of restoring the health of oceans and waters by 2030. Through research, innovation, and stakeholder collaboration, the project supports regional engagement, bringing forward actionable solutions to major climate and environmental challenges.

New film by the Ecological Continuity Trust (ECT)’ highlights the power of long-term ecological research

A new film, narrated by Jonathan Silvertown (University of Edinburgh), explores the importance of long-term ecological experiments (LTEs) in addressing today’s climate and biodiversity crises. Silvertown, a founding trustee of the Ecological Continuity Trust (ECT), highlights the charity’s role in supporting LTEs essential to understanding environmental change. Featured LTE sites include Park Grass in Hertfordshire, Buxton Climate Change Impacts Laboratory, BIFoR-FACE in Staffordshire, and the Wicken Fen Vision in Cambridgeshire. You can view the full film on the Trust’s [YouTube page](#).

Protecting Cornwall’s Coast: The 2 Minute Foundation’s New Film Series



on Sand Dunes

Screenshot of Making Space For Sand - Episode 1

The Cornwall-based charity, The 2 Minute Foundation, has launched a [new film series](#) spotlighting the critical role of sand dunes in coastal protection, biodiversity, and climate change mitigation. Supported by the Defra funded [Making Space for Sand project](#), each episode showcases the formation and conservation of these fragile ecosystems, highlighting their role in reducing coastal erosion, supporting diverse species, and capturing carbon. The series emphasises the urgent need to protect these landscapes as environmental pressures mount.

Sand Dune and Shingle Network Website relaunched

The Network is pleased to announce the relaunch of our website (www.coast.hope.ac.uk). The updated site makes it easier than ever to access information about upcoming events, membership and previous publications.

Events

In 2025, the Sand Dune and Shingle Network will be hosting events, both online and in person, designed to foster knowledge-sharing and collaboration among members.

These events will include webinars, workshops, and on-site gatherings, covering a variety of coastal topics relevant to practitioners and researchers. Whether attending virtually or joining us in person, members will have the opportunity to connect, exchange ideas, and learn from leading voices in the field of coastal science and conservation. If you have any suggestions for an event please get in touch! (dunes@hope.ac.uk)

Keep up to date on all our latest events via [LinkedIn](#) and the Events section of our [website](#).

New Horizons: Pioneering Research in Dunes and Shingle (Online)

22nd January 2025

This half-day online event hosted by the Sand Dune and Shingle Network (10 am - 3 pm GMT) is designed to showcase the latest research by PhD and early career researchers investigating coastal sand dunes, machair and shingle beaches.

We invite anyone interested in presenting their research to [submit an abstract](#) before midnight on **Monday 16th December 2024**. If you wish to attend the conference, please register [here](#).

The conference is open to anyone with an interest in coastal ecology, geomorphology, or conservation, so please feel free to share this invitation with your networks. We warmly welcome all attendees.

Sand Dune and Shingle Network Conference (Liverpool)

16th - 18th September 2025

The Sand Dune and Shingle Network is hosting a three-day conference at Liverpool Hope University. This in-person event will feature presentations, workshops, and discussions focused on current research and management of sand dune, machair and shingle habitats. Attendees will also have the opportunity to join a field trip to local sand dune sites to observe conservation efforts firsthand. The conference is open to researchers, practitioners, and those interested in coastal environments. Registration to attend the conference will open in spring 2025.

Recent Publications

Flora/Fauna

Alien plant invasion across coastal dunes of Ukraine.

<https://doi.org/10.1007/s11756-023-01369-8>

This study found that in Ukrainian coastal dunes, 16.3% of plant species were alien, with the majority originating from the Mediterranean-Turanian region. The distribution of alien plants was influenced by various abiotic factors, with the highest number found on shifting dunes, highlighting the need for focused conservation efforts to prevent biodiversity loss.

The spider fauna of Danish coastal dune habitats revisited after 25 years: evidence of faunistic impoverishment.

<https://doi.org/10.1007/s10841-024-00567-2>

This 2022 study revisiting spider assemblages in coastal dune habitats of Denmark found a 12% reduction in spider abundance and a 13% decline in species richness compared to 25 years ago. The spider fauna showed a shift towards fewer habitat specialists, smaller body sizes, increased dominance, and greater representation of shade and humidity-loving species, with some species showing earlier spring activity.

Seawater spray as a significant nitrogen source across coastal dune vegetation gradients <https://doi.org/10.1016/j.ecss.2024.108941>

Researchers assessed the importance of seawater spray as a nitrogen source and its impact on plant community composition in a Mediterranean dune system in SW Spain. Leaf nitrogen and carbon content, along with $\delta^{15}\text{N}$, $\delta^{13}\text{C}$, and soil nutrient levels, were measured across a beach-inland gradient. Results showed that species near the coast relied on marine nitrogen sources, while those farther inland used non-marine sources. These findings highlight seawater spray as a significant nitrogen input influencing dune vegetation and plant strategies.

Geomorphology

Patterns and controls of topographic change within the deflation basins of a trough and bowl coastal blowout.

<https://doi.org/10.1002/esp.5930>

This study examined monthly topographic changes over 23 months in two blowouts at Ainsdale Sand Dunes, North-West England. The results showed that surface changes varied between the bowl and trough blowouts and were influenced by precipitation, slope, and wind direction, highlighting the complexity of surface change in vegetated

AeoLiS: Numerical modelling of coastal dunes and aeolian landform development for real-world applications. <https://doi.org/10.1016/j.envsoft.2024.106093>

This research created a predictive tool (AeoLiS) for dune development to support coastal management decisions. The model incorporates topographic steering of wind shear, slope avalanching, and vegetation processes such as growth and wind shear reduction.

Exploring wind flow dynamics in foredune notches using Computational Fluid Dynamics <https://doi.org/10.1016/j.coastaleng.2024.104646>

Computational fluid dynamics (CFD) was used to analyse the impact of notch dimensions on wind flow. Results show that narrower notches (25 m wide) aligned with prevailing winds enhance sand transport, highlighting the importance of notch design in coastal dune restoration.

Controls on blowout evolution in southern Portugal: A 49-year analysis <https://doi.org/10.1016/j.scitotenv.2024.176769>

Research on blowouts on the Ancão Peninsula (South Portugal) from 1972 to 2021 analysed their evolution, focusing on morphometric characteristics, phases, and drivers. Blowout genesis was driven by low-to-moderate winds and extreme wave events, lasting 1-2 years. The development phase, ongoing, involved blowout expansion and rotation influenced by both external and internal factors. Complete decay phases were not observed, except for artificial sealing due to fencing, which lasted 4 years. The study suggests that a full natural blowout cycle could take over five decades, with complex feedbacks.

Management and Policy

The Politics of Amphibiousness: Shifting Coastal Management in the Netherlands. <https://doi.org/10.1177/016224392412397>

This article analyses a shift in Dutch coastal management from resisting to encouraging dynamic sea-land interactions. Using Ameland in the Wadden Sea as a case, it develops “amphibious response-ability,” showing how dynamic management enables certain interactions while

restricting others. When rapid erosion damaged a gas platform, the limitations of this approach surfaced. The authors propose forming diverse knowledge alliances to navigate the political complexities of amphibious coastal management and improve responses to coastal change.

An analysis of coastal sand dune management in Oregon (United States) from the 19th to the 21st century. <https://doi.org/10.1016/j.landusepol.2023.107048>

This research analysed Oregon's coastal sand dune management policies over two contrasting periods, 19th to the late 20th century and the early 21st century, highlighting a shift from stabilisation efforts using non-native beachgrasses to restoration efforts focused on removing these invasive species. The authors concluding that while removing the invasive grasses helped to restore native biodiversity, it also lowered dune heights, increasing the risk of coastal flooding, creating a complex challenge for future land use policies.

Assessing the impact of hurricane Fiona on the coast of PEI National Park and implications for the effectiveness of beach-dune management policies <https://doi.org/10.1007/s11852-024-01050-5>

The study assessed the impacts of Post-tropical Storm Fiona on the sandy beaches and foredunes of Prince Edward Island National Park, Canada, with waves reaching offshore heights of approx. 8 m and storm surges up to 2 m. Using survey data, ground photography, and UAV imagery from before and after Fiona, researchers observed that larger dunes generally showed erosion on the stoss slope, with landward retreat of up to 6 m, yet minimal changes in crest height. Smaller foredunes (<5 m high) experienced significant profile erosion, and some perched on bedrock faced complete loss, exposing underlying surfaces. Despite Fiona's force, the overall impact on PEINP's beach systems was modest, largely due to management practices that protect foredunes by reducing human interference and preventing "coastal squeeze." These policies strengthen the natural resilience of beach-foredune systems against storms and sea-level rise.

This newsletter has been compiled by Thomas Smyth, Paul Rooney and Jordan Masters

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Cover Photo Foredune blowout at Ainsdale Dunes NNR (Thomas Smyth)

The Sand Dune and Shingle Network is based in Liverpool Hope University and operates with the support of a memorandum of understanding between Liverpool Hope University, National Trust, Natural England, Cyfoeth Naturiol Cymru (Natural Resources Wales), NatureScot, The Department of Agriculture, Environment and Rural Affairs (DAERA), Kenneth Pye Associates Limited and Oleo Ecology.